TITLE OF THE INVENTION

LINEAR MOTOR AND LINEAR COMPRESSOR HAVING THE SAME

CROSS-REFERENCE TO RELATED APPLICATION

This application claims the benefit of Korean Patent Application No. 2003-83190, filed November 21, 2003 in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates, in general, to a linear compressor and, more particularly, to a linear compressor having a linear motor that is supplied with power and operates a piston.

2. Description of the Related Art

Generally, a linear compressor is used to compress a refrigerant of a refrigeration apparatus, such as a refrigerator and an air conditioner, and refers to a compressor adopting a linear motor, which reciprocates linearly, as a drive means to reciprocate a piston.

A conventional linear compressor includes a cylinder block in which a compression chamber is formed, a piston which is placed in the compression chamber to be reciprocated, and a cylinder head in which an intake chamber to draw a refrigerant and a discharge chamber to discharge the refrigerant are formed.

Furthermore, for a drive means to reciprocate the piston, the conventional linear compressor includes a linear motor, which includes a mover combined with the

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piston and integrated with a cylindrical magnet surrounding the cylinder block, and a first core and a stator fixedly arranged in inside and outside of the mover, respectively.

The stator includes a second core formed of electrical steel sheets and a coil configured to generate a magnetic flux. In the second core, one side of the second core facing the magnet is opened, and two extended parts extend inward from both ends of an opening of the second core to a predetermined distance to cover portions of the opening. The two extended parts enable an area of the second core facing the magnet to increase so as to increase strokes of the magnet.

The coil is placed in a space inside the two extended parts, so that the second core generates a magnetic flux and the magnetic flux flows from the second core to the first core through the magnet.

However, in the conventional linear compressor, a location of installation of the coil is limited to a space inside the two extended parts of the second core.

Accordingly, a problem arises in that, if a diameter of the coil increases to increase an impellent force of the mover, a volume of the stator also has to increase.

SUMMARY OF THE INVENTION

Accordingly, it is an aspect of the present invention to provide a linear motor and linear compressor having the linear motor, which is capable of effectively improving an impellent force of a mover by improving a configuration of a coil wound around a stator.

Additional aspects and/or advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may

be learned by practice of the invention.

The above and/or other aspects are achieved by providing a linear compressor, including a mover reciprocating together with a piston to compress a refrigerant, and a stator generating a magnetic field to interact with the mover, the stator including a core provided with an opening at outside thereof, two extended parts extended inward from both ends of the opening of the core to cover portions of the opening and to be spaced apart from each other, and a coil wound in a space inside the two extended parts and a space between the two extended parts.

In the linear compressor, the coil is wound in a shape corresponding to shapes of the two extended parts.

In the linear compressor, the two extended parts has opposite ends that are inclined to approach each other at outside edges thereof.

In the linear compressor, the two extended parts has opposite ends that are each shaped in a semicircle.

The above and/or other aspects are achieved by providing a linear motor, including a stator comprising a second core provided with an opening at outside thereof, two extended parts extended inward from both ends of the opening of the second core to cover portions of the opening and to be spaced apart from each other, and a coil wound in a space inside the two extended parts and a space between the two extended parts, a first core, and a magnet reciprocating between the stator and the first core.

In the linear motor, the coil is wound in a shape corresponding to shapes of the two extended parts.

In the linear motor, the two extended parts have opposite ends that are inclined to approach each other at outside edges thereof.

In the linear motor, the two extended parts have opposite ends that are each shaped in a semicircle.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other aspects and advantages of the invention will become apparent and more readily appreciated from the following description of the preferred embodiments, taken in conjunction with the accompanying drawings of which:

FIG. 1 is a side cross-section showing an entire structure of a linear compressor, according to the present invention;

FIG. 2 is a perspective view showing a stator and a mover of the linear compressor of FIG. 1;

FIG. 3 is a cross-section showing a stator, according to another embodiment of the present invention; and

FIG. 4 is a cross-section showing a stator, according to still another embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference will now be made in detail to the present preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout.

A linear compressor according to the present invention, as shown in FIG. 1, includes a closed container 10 to form a closed structure by combining an upper container 11 with a bottom container 12, a compression unit 20 to draw, compress and discharge a refrigerant, and a drive unit 30 to operate the compression unit 20.

The compression unit 20 includes a cylinder 21 forming

a compression chamber 21a, a piston 22 placed in the compression chamber 21a to be reciprocated, and a cylinder head 23 to draw and discharge the refrigerant. Furthermore, a support part 25 extending outward from an outer surface of a lower portion of the cylinder 21 is provided to support a stator 32 of the drive unit 30, which is described later. An intake chamber 23a and a discharge chamber 23b operated in conjunction with the compression chamber 21a are provided in the cylinder head 23 to draw and discharge the refrigerant as the piston 22 reciprocates, respectively. Furthermore, a valve plate 24, on which an intake valve 24a and a discharge valve 24b to allow the intake chamber 23a and the discharge chamber 23b to be opened and closed, respectively, is provided between the cylinder head 23 and the cylinder 21.

The drive unit 30 includes a linear motor having a first core 31 combined with an outside of the cylinder 21, the stator 32 spaced apart from the first core 31 by a certain distance, and a mover 35 provided between the first core 31 and the stator 32 to interact with an electric field generated by the stator 32.

The mover 35 includes a cylindrical magnet 35a placed to surround the cylinder 21 and a holder part 35b to fasten and support the magnet 35a. The holder part 35b of the mover 35 is placed coaxially with respect to a connection shaft 22a provided on an upper portion of the piston 22 so that the holder part 35b of the mover 35 reciprocates vertically, together with the piston 22.

The first core 31 and the stator 32 are provided inside and outside the magnet 35a, respectively. In this case, the first core 31 is provided outside the cylinder 21 to form a cylindrical shape, so that the first core 31 functions to simultaneously guide the reciprocating of the

mover 35 and allow a magnetic flux to smoothly flow from the stator 32 through the magnet 35a of the mover 35.

The stator 32 includes a second core 33 formed of electrical steel sheets and a coil 34 to generate a magnetic flux. A lower end of the stator 32 is supported by the support part 25, and an upper end of the stator 32 is supported by a fastening frame 40.

A structure of the stator 32 of the linear compressor according to the present invention is described in more detail with reference to FIG. 2 below.

Referring to FIG. 2, the second core 33 of the stator 32 is formed by overlapping electrical steel sheets in a radial direction. In this case, a side of the second core 33 facing the magnet 35a is opened, and first and second extended parts 33b and 33c are extended inward from upper and lower ends of an opening 33a of the second core 33 to cover upper and lower portions of the opening 33a.

Accordingly, an area of the second core 33 facing the magnet 35a is increased by the first and second extended parts 33b and 33c, thus enabling strokes of the magnet 35a to increase. The first and second extended parts 33b and 33c are provided to be spaced apart from each other to allow a magnetic flux generated by the coil 34 to smoothly flow from the second core 33 to the first core 31 through the magnet 35a.

The coil 34 is wound through a first accommodation part 33d formed inside the first and second extended parts 33b and 33c, and a second accommodation part 33e formed in a space between the first and second extended parts 33b and 33c. In this case, the coil 34 is wound in a shape corresponding to the first accommodation part 33d and the second accommodation part 33e to be maximally wound in the first and second accommodation parts 33d and 33e.

As shown in FIG. 3, in the second core 33, ends of the first and second extended parts 33b and 33c may be inclined to approach each other at outer edges thereof to prevent a magnetic flux from leaking and to allow the magnetic flux to flow to the magnet 35a while the magnetic flux flows through the space between the first and second extended parts 33b and 33c.

In this case, the coil 34 is wound in a shape corresponding to shapes of the first and second extended parts 33b and 33c to allow the coil 34 to be wound in the space between the first and second extended parts 33b and 33c.

As shown in FIG. 4, ends of the first and second extended parts 33b and 33c may be each shaped in a semicircle to prevent a magnetic flux from leaking. In this case, the coil 34 is wound in a shape corresponding to the shapes of the ends of the first and second extended parts 33b and 33c.

An overall operation and effect of the linear compressor according to the present invention are described below.

When Alternating Current (AC) power is applied to the coil 34 of the stator 32, a magnetic field is generated between the stator 32 and the first core 31. Accordingly, the mover 35 with the magnet 35a combined therewith reciprocates vertically because of a characteristic of the AC power in which a polarity of the magnetic field is periodically changed. Furthermore, the piston 22 with the mover combined therewith compresses a refrigerant while reciprocating in the compression chamber 21a as the mover 35 reciprocates.

In this case, in the stator 32 provided in the linear compressor of the present invention, the coil 34 is wound

in not only the first accommodation part 33d formed inside the first and second extended parts 33b and 33c but also the second accommodation part 33e formed in the space between the first and second extended parts 33b and 33c. Accordingly, when the coil 34 is wound a same number of times as in a conventional compressor, a diameter of the coil 34 may be increased.

Accordingly, since a resistance of the coil 34 is reduced, a value of a current passing through the coil 34 and a magnetic flux generated around the coil 34 increase, thus increasing an impellent force of the mover 35.

As described above, a stator of the linear compressor according to the present invention has an opening at one side, and includes a core provided with two extended parts at the opening, a coil wound in a space inside the two extended parts and a space formed between the two extended parts.

That is, the coil is also wound in the space between the two extended parts, so that a magnetic flux generated around the coil is increased, thus increasing an impellent force of the mover. Accordingly, a performance of a compressor is entirely improved.

Although a few preferred embodiments of the present invention have been shown and described, it would be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principles and spirit of the invention, the scope of which is defined in the claims and their equivalents.